



U.S. DEPARTMENT OF  
**ENERGY**

**Nuclear Energy**

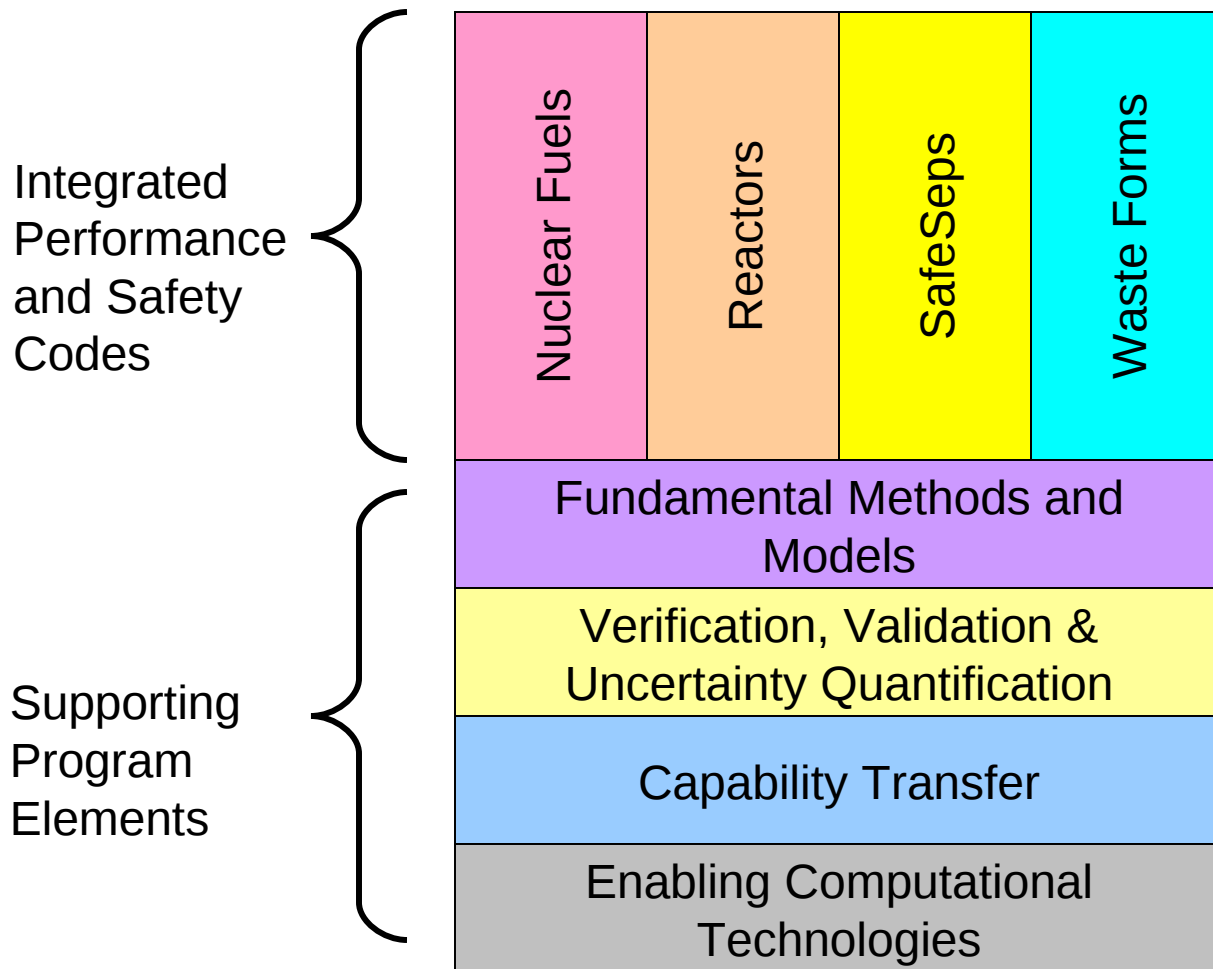
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# **Nuclear Energy Advanced Modeling and Simulation**

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# NEAMS Organization Mirrors NNSA ASC Program





# NEAMS Program Overview

## ■ Integrated Performance and Safety Codes (IPSC)

- Continuum level codes that will predict the performance and safety of nuclear energy systems technologies
- Attributes include 3D, science based physics, high resolution, integrated systems
- Large code teams (~25 people)
- Single “center of gravity”
- Long-term commitment (~10 years)
- Codes “born” with verification, validation and uncertainty quantification
- Using interoperability frameworks and modern software development techniques and tools

## ■ Program Support Elements

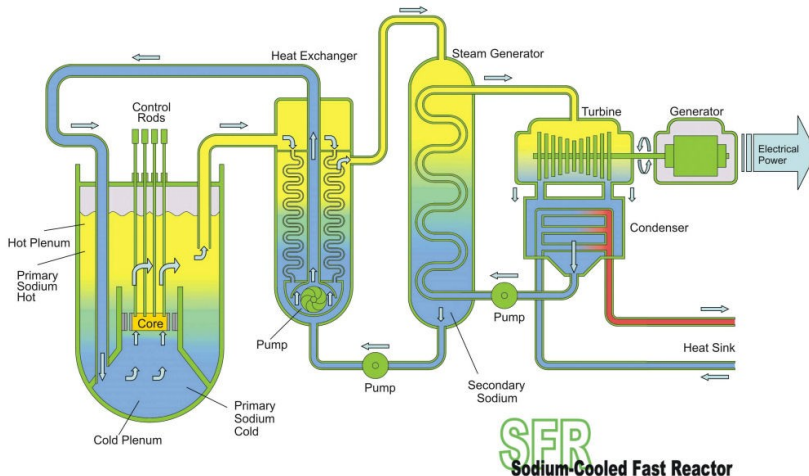
- Develop crosscutting (i.e. more than one IPSC) required capabilities
  - Fundamental Methods and Models
  - Verification, Validation and Uncertainty Quantification
  - Interoperability frameworks
  - Enabling Computational Technologies
- Provide a single NEAMS point of contact for crosscutting requirements (e.g. experimental data, computer technologies)
- Smaller, more diverse teams to include laboratories, universities and industries.
- Shorter timelines



# Reactor IPSC

## ■ Scope

- Predict performance and safety of fast reactors over 40 – 60 year lifetime
- Initial focus on reactor core
- As code progresses will extend to additional systems
- Many underlying physical processes (e.g. thermodynamics, neutronics) extensible to other reactor types (gas-cooled, light water)





# Nuclear Fuels IPSC

## ■ Scope

- Predict performance of fast reactor fuels over 18 to 24 month lifetime in core
- Develop suite of modeling tools to predict microscale behaviors and couple them through the mezzo scale to the continuum
- Develop with flexibility to extend to nuclear fuels for other reactor types (gas, light water)
- Fuel performance modeling is inherently multi-scale & multi-physics
- Coupling techniques not well understood
- V&V, UQ of coupled simulations also not well understood

